# Energy Management

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*Journal – American Water Works Association* 90:2:40 (Feb 1998)

Arora, Harish and LeChevallier, Mark W. Energy Management Opportunities

*Operations Forum – Water Environment Federation* 15:6:17 (Jun 1998)

Sanger, Duane M. Energy Management

## Introduction

With today's limited financial budget, water and wastewater plants are looking for ways to reduce operating costs. Energy management is the most helpful way to stay within budget constraints without compromising the quality of service to customers.

Energy Efficiency not only saves money, but also helps prevent pollution. The amount of money that a water/wastewater company will save is determined by the different types of energy efficient equipment and methods in use on a daily basis. Energy Awareness should be developed in-house to demonstrate benefits rather than sacrifices to its users (including operators and visitors).

Generating electricity requires the burning of fossil fuels. In the United States, electricity generation accounts for 35% of all U.S. emissions of carbon dioxide (major contributed of global warming and climatic change), 75% of sulfur dioxide (a respiratory irritant and component of acid rain), and 38% of nitrogen oxides (a contributor to smog and component of acid rain). Each time a light switch, computer, heating system or air conditioner is turned on, a power plant consumes fuel to produce electricity and produces air pollution.[1] The true cost of using fossil fuels for highly consumptive energy needs is not just the price mankind will pay, but is also the price that the environment will pay.

## Identifying Energy Efficiency

Most energy consumed by a drinking water supply system, approximately 80 to 90 %, is associated with pumping water. Pumps account for 75% of electricity used in wastewater treatment plants. Electric utilities must design and build facilities that accommodate maximum electricity usage. The American Water System (AWS), a group of investor-owned utilities, has acknowledged how to save more than a tenth of the $30 million it now spends on energy each year. AWS identified the cost-cutting techniques after surveying its member companies and auditing four representative plants. The audits identified energy savings ranging from 10 to 32 % when compared with 1993 electrical costs.

The Electrical Power Research Institute (EPRI), a research foundation supported by electric utilities, has sponsored many projects about energy-savings opportunities for water supply and wastewater treatment systems. In an EPRI report, Burton[2] et al describes energy conservation for water suppliers. Another EPRI manual[3] describes how to conduct energy audits for water supply systems.

## Understanding your Electricity Bill

A complete understanding of the charges in an electric bill is the first step toward evaluating energy savings.[4] A demand charge is determined by peak electricity use during a particular time period that is typically only 15-30 minutes long. This demand charge is important because a 15-minute period can lead to higher prices for the rest of the billing cycle. Not only do utilities charge for kilowatt-hours used, but they also charge for peak demands to cover costs of providing reserve capacity. For example, turning one pump off before starting another results in demand charges for just one pump. However, turning a second pump on before turning the first one off can result in demand charges for both pumps.

## Managing Electricity Demand

Some cost cutting techniques pay off quickly or within a reasonable time. One method is to reduce demand charges by making operational changes – for example, using a standby diesel pump for occasions other than power failures or delaying pumping until off-peak rates are in effect. Installation of variable-frequency drives and energy-efficient motors for selected pumps, and installing energy-efficient lighting are suggested operational changes to manage electricity demand.

## Installing Variable-Frequency Drives

Variable-frequency drives control pump speed and flow electronically. They are more efficient that variable speed drive, which are mechanical. For pumps with throttling valves, variable-frequency drives are the energy efficient choice. For financial feasibility, a recommended energy conservation measure with a simple payback period of less than 6 years is considered cost-effective. In most instances, replacement of an existing variable speed drive requires a longer payback period.

## Installing Energy Efficient Motors

Energy-efficient motors consume less energy than standard-efficiency motors. In general, it cost more to install energy-efficient motors, but the energy savings can result in lower operating costs. Replacement of a standard efficiency motor will have a long payback period. Currently, most motors at treatment plants operate efficiently at 70% to 80% of their horsepower because the trend in years past was to oversize motors in anticipation of future population growth.[5] Critical to energy conservation is ensuring that motor-driven equipment - such as pumps, fans and compressors, - are properly sized to operate efficiently. If pump wear is allowed to exceed normal operating limits, pumping systems will continue to work but use significantly more energy.

## Install Efficient Lighting

Efficient lighting can also provide significant energy with low overall payback periods. Motion detectors automatically turn off lights in areas not continuously occupied, such as restrooms, conference rooms, and other offices. Standard incandescent and fluorescent lamps are good candidates for lighting upgrades. Compact fluorescent lamps can replace incandescent lamps. For reducing energy costs while extending service life, mercury vapor lamps can be replaced with high-pressure sodium lighting.

## Conclusion

Energy costs will continue to be a large segment of the water and wastewater facilities budget. In the energy market, competition will continue to increase as deregulation of energy utilities gains momentum in response to the 1992 U.S. Energy Policy Act. The amount of savings will vary from plant to plant. Significant cost savings can be realized if cost-effective energy conservation measures are implemented

## References

[1]Healthcare Energy Efficiency, "Why Energy Efficiency?"
http://www.napenet.org

[2]BURTON, F.L. & STERN, F. Water and Wastewater Industries: Characteristics and DSM Opportunities. Rept. TRm-102015, Electric Power Res. Inst., Palo Alton, Calif. (1993).

[3]REARDON, D. Energy Audit Manual for Water-Wastewater Facilities. Rept. CR-104300. Community Envir. Center, Electric Power Res. Inst., St. Louis, Mo. (1994).

[4]Reduce Electricity by Understanding Your Electric Bill. Rept. BR-103303. Community Envir. Center, Electric Power Res. Inst., St. Louis, Mo. (1993).

[5]For more information on using energy-efficient electric motors, call the U.S. Department of Energy Motor Challenge Information Clearinghouse at (800) 862-2086 or send a fax to 1-360-586-8303. Information can be accessed via the internet: http://www.motor.doe.gov.

## Additional Information

Technology and Strategies to Improve Your Bottom Line on the internet:
http://www.energy.ca.gov/water